DEC STD 022-1 Cable and Harness Documentation: Drawing Requirements for 70-Class and Option Numbers

DOCUMENT IDENTIFIER: A-DS-EL00022-01-0000 Rev C1, 01-Nov-1990

ABSTRACT: This section of DEC STD 022 defines the drawing requirements for cable and harness design and assembly documentation.

APPLICABILITY: The requirements of this document are mandatory for Engineering and Engineering Services personnel who are responsible for the contents and drafting of cable or harness drawings.

STATUS: APPROVED 01-Nov-1990; use VTX SMC for current status.

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1 INTRODUCTION

1.1 PURPOSE

This section of DEC STD 022 defines the cable or harness drawing requirements for accuracy, approved design, completeness, and clarity required for cable and harness manufacture and assembly by or for Digital, in 70-class or option number applications.

1.2 SCOPE

The drawing requirements stated in this section pertain to views, format, parts lists, wire lists, drawing legends, and assembly notes used to document the design and manufacture of cables and harnesses.

2 TERMS AND DEFINITIONS

A cable is an assembly consisting of two or more conductors, usually enclosed in a single insulation wrapper or sheath, that is cut to a specific length and contains a specific number of conductors. A cable is terminated with special devices such as terminals, module card connectors, and so forth. See Figures 1 and 2.

A harness is a configuration of individual wire and/or cable lengths and terminations that are secured into an inseparable assembly to make an electrical connection within an assembly. See Figure 3.

This standard uses the following terms to define the parts of a harness or cable assembly.

trunk - The main section of a harness.

leg - Two or more bundled leads that branch from the harness trunk.

bundling - The process in which a group of wires are held together by tubing, tie wraps, clamps, and so forth.

breakout point - The point at which a wire or group of wires emerge from a portion of a wire harness or a cable assembly.

point number - The assigned point-to-point number of each wire breakout on the harness.

reference designator - The assigned reference number for each component or connector on a harness or cable drawing, when required (P1, J1, and so forth).

match lines - Cutting lines alphabetically labeled to match removed sections.

Figure 1: Flat Ribbon Cable

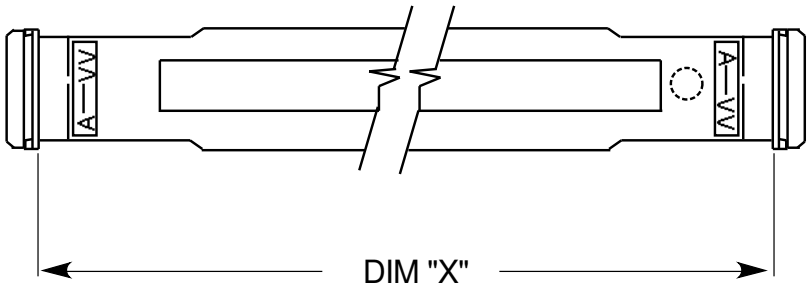


Figure 2: Wire Cable

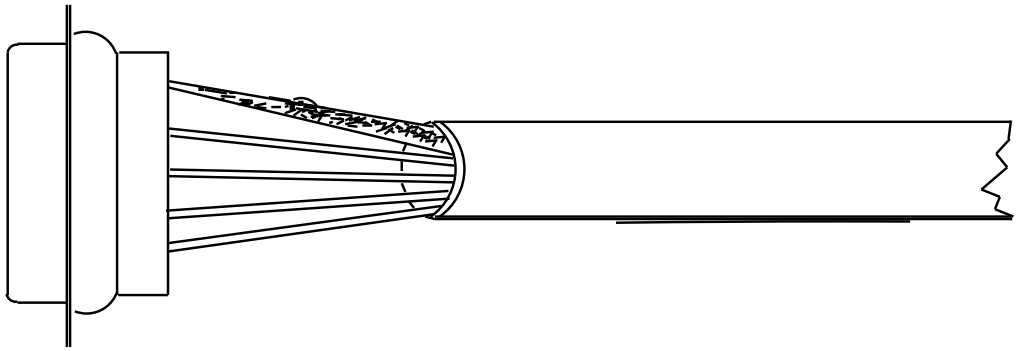
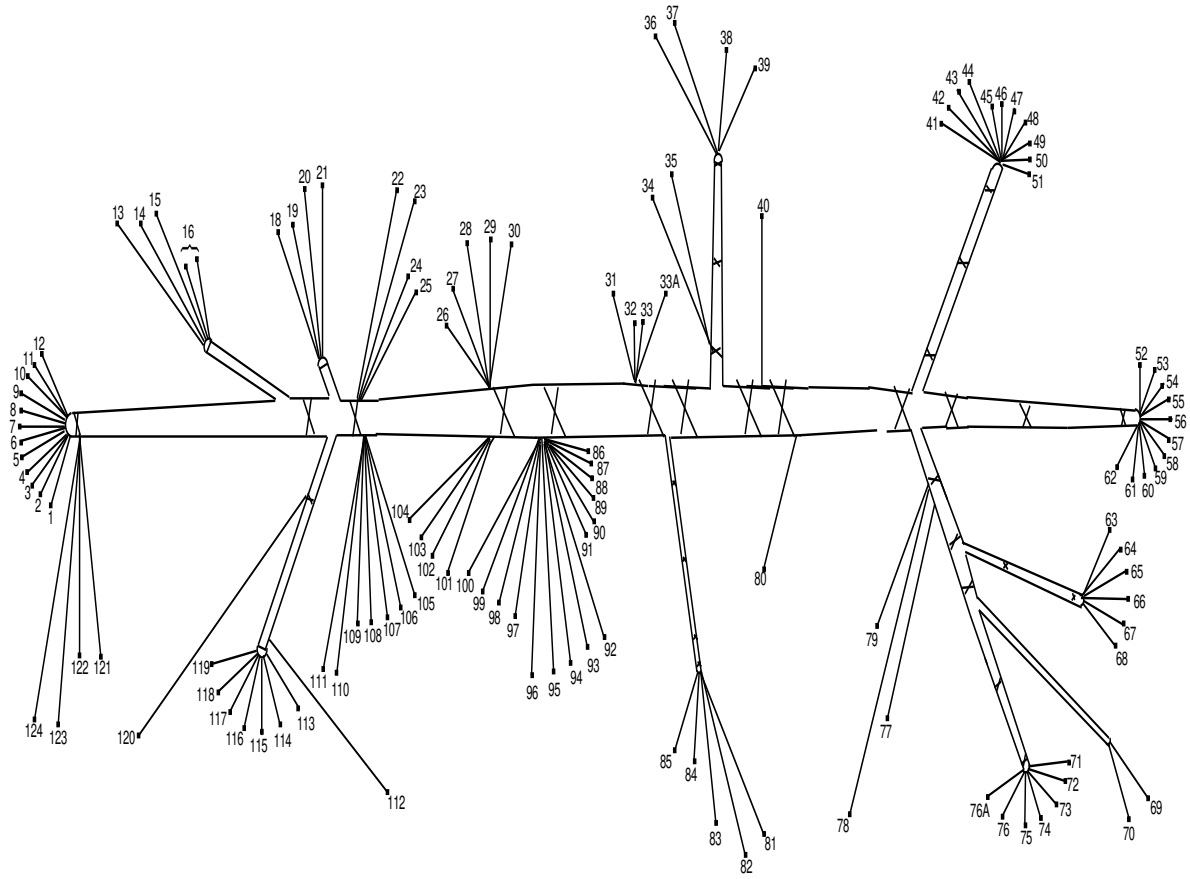


Figure 3: Wire Harness



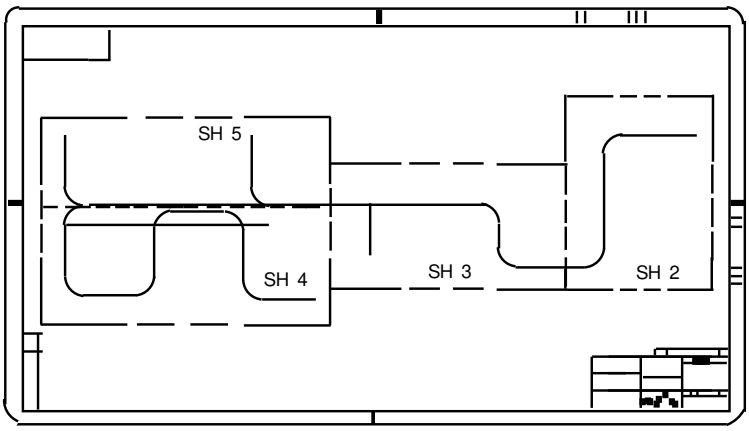
3 REQUIREMENTS

Cable and harness design and assembly require an Inseparable Assembly (IA) drawing and a Parts List (K-PL). These drawings are mandatory for production.

3.1 MULTISHEET DRAWINGS

If a harness layout requires three or more sheets, provide a layout diagram showing the general relationship of the sheets as sheet 1. See Figure 4.

Figure 4: Multisheet Harness Layout



3.2 FORMAT

Harness and cable drawing formats must comply with *DEC STD 013-0 Standard Engineering Drawing Formats and Forms - Introduction.*

3.3 SCALE

Harness drawings must be full size, on a 1-to-1 scale, with a "scale" ruler shown on the drawing. This is required because the harness drawing is the pattern used to actually wire the harness. See Figure 6.

3.4 VIEWS

All views on a cable drawing should be isometric or three-dimensional. No view will be shown rotated or twisted. However, in harness drawings, any part of the harness that extends beyond the plane of the paper should be represented by rotated views or sections. See Figure 6, View A-A.

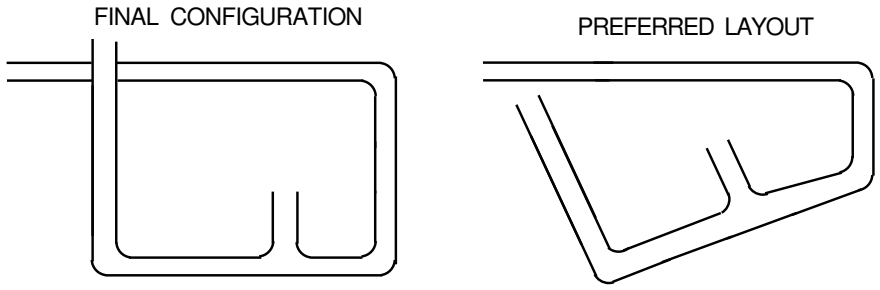
3.5 LAYOUT

When a leg of a harness comes close to or crosses another leg at right angles, lay out the harness as shown in Figure 5. This allows for ease of fabrication yet permits the harness to conform to the original, desired configuration.

NOTE

Because the harness drawing becomes the pattern used to actually build the harness, crossing wires should be avoided to ease that wiring process.

Figure 5: Preferred Harness Layout



3.5.1 Bend Radius

Radii measurements for wire bundles and cables shall conform to the requirements stated in *DEC STD 116-4 Workmanship Standards Manual - Cables and Harnesses.*

3.6 DIMENSIONS

Dimensions must be in accordance with *DEC STD 114-0 Engineering Drawing Requirements - Industry Standards Adopted by Digital Engineering and Manufacturing Documentation Organizations.*

NOTE

Do not use both metric and U.S. customary cable lengths on the same cable or harness drawing.

3.6.1 Outline

Show the outline at the approximate diameter of the finished harness. See Figure 6.

3.7 BROKEN SECTIONS

When there are long straight sections of a harness body and it would be impractical to draw them out, they may be shown broken, if:

a. The bundling requirement is continuous;

b. There are no breakouts, bends, or other requirements; and

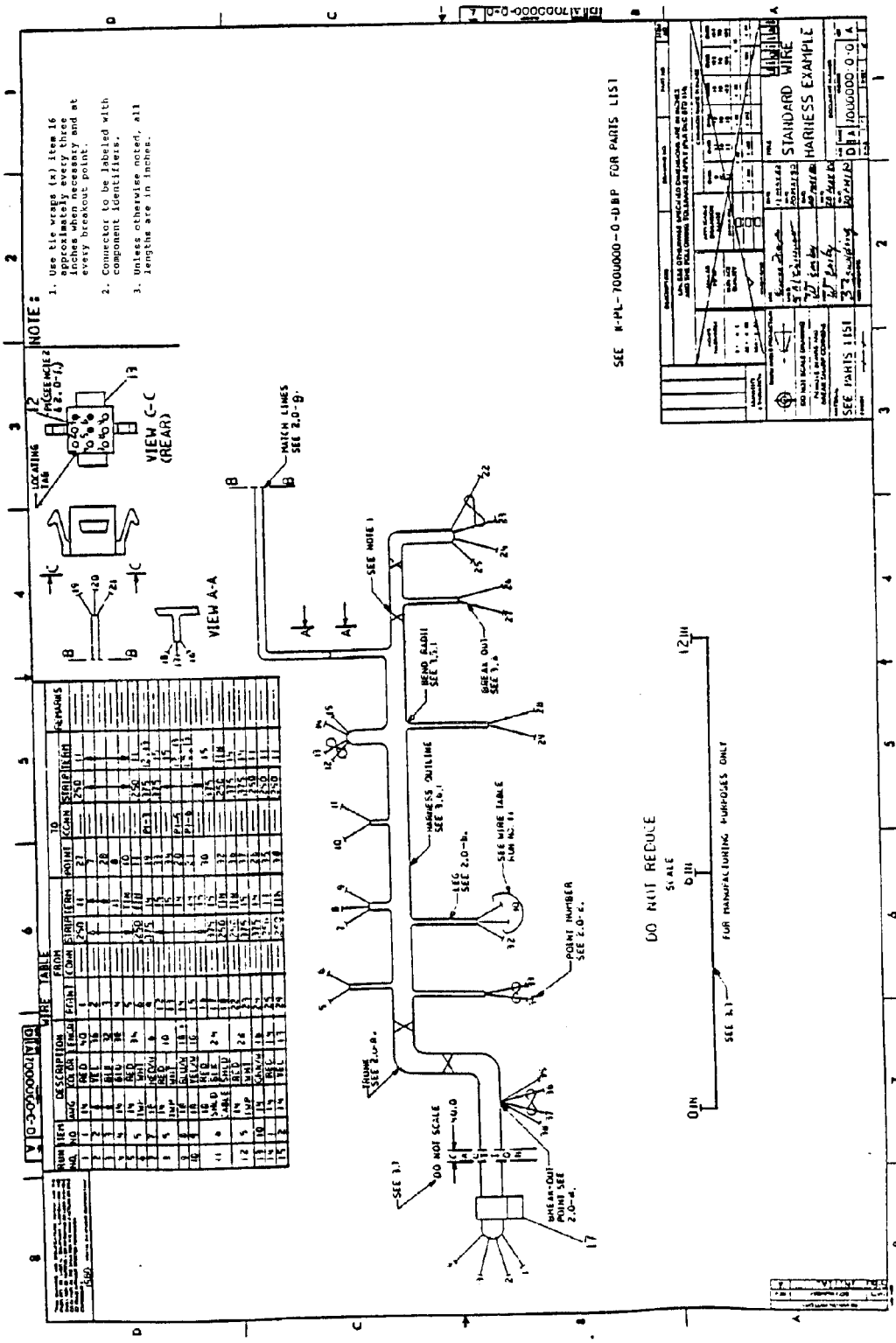
c. When extended to full size, the delineation will not cause crossovers or other fabrication obstacles.

Use the cutting plane line to indicate each end of broken sections. Place "CAUTION" notation between cutting plane lines to indicate missing sections. Indicate the length of removed section between cutting planes. See Figure 6.

3.8 BREAKOUT LINE

Use a single line to indicate all breakouts from each breakout point, regardless of type of wire. See Figure 6, point 27.

Figure 6: Sample Harness Drawing


NOTE:
1. Use tie wraps (x) item 16 approximately every three inches when necessary and at every breakout point.
2. Connector to be labeled with component identifiers.
3. Unless otherwise noted, all lengths are in inches.
WIRE TABLE
VIEW C-C (REAR)
VIEW A-A
MATCH LINES SEE 2.0-g.
SEE NOTE 1
HARNESS OUTLINE SEE 1.0-j.
SEE WIRE TABLE FOR NO. 11
POINT NUMBER SEE 2.0-c.
DO NOT SCALE
SEE 3.1
FOR MANUFACTURING PURPOSES ONLY
STANDARD WIRE HARNESS EXAMPLE
SEE PARTS LIST

3.9 DRAWING LEGENDS - CABLE DRAWINGS

The legend lists part numbers covered by the drawing and dimensions that differentiate one variation from another. The variation identifier equals the X dimension. This length variation is indicated by "DIM X". This equals the length of free cable between back ends of the connectors. "DIM Y" refers to the precut length. This measurement includes allowances for the connector or terminal connection. See Tables 1 and 2 for examples, and Figure 7 for an on-sheet legend.

Table 1: Example Drawing Legend with U.S. Customary Lengths

Part Identifier	Dim "X" Variation	Dim "Y" (Precut) Reference
BC08A-0E	5 inches	12 inches
BC08A-12	12 feet	12 feet 7 inches
BC08A-YA	3,000 feet	3,000 feet 7 inches

Table 2: Example Drawing Legend With Metric Lengths

Part Identifier	Dim "X" Variation	Dim "Y" (Precut) Reference
BN08A-0E	0.5 m	0.6778 m
BN08A-12	12.0 m	12.18 m
BN08A-MA	3000.0 m	3000.18 m

3.9.1 Precut Lengths in Legend

The purpose of having a precut size in the legend is to facilitate production when a large quantity of the same length cable is to be manufactured. The precut size is determined by adding a connector allowance for each connector to the cable length. The connector allowance will vary depending on the size and type of connector used.

3.9.2 Tolerances in Legend - Cable Drawings

Tolerances for cable lengths shall appear on the drawing in either the legend or wire table, whichever is appropriate. Existing tolerance blocks shall be crossed out of the format. When tolerances are to appear in the wire table, use the "Remarks" column. See the on-sheet wire tables in Figures 6 and 7.

3.10 WIRE TABLE

An on-sheet wire table shall be used on harness and cable drawings and located preferably at the upper left and to the right of the Digital Proprietary Rights Block on the drawing. However, if the physical makeup of the harness restricts using this area, it is recommended that the table be added as Sheet 2 of the IA drawing. The wire table should include: run number, item number, point-to-point connections, precut lengths, and strip lengths. See Figures 6 and 7.

3.11 STANDARD DRAWING NOTES

Drawing notes shall be used to indicate special engineering requirements or to aid manufacturing in assembly. For example:

NOTE

1. **Use tie wraps (x), item 16, approximately every three inches when necessary and at every breakout point.**
2. **Connector to be labeled with component identifiers.**
3. **Unless otherwise noted, all lengths are in inches.**

3.12 POINT NUMBERS

3.12.1 Cable Drawings

Assign point numbers in sequence, starting in the lower left corner of the cable view. Proceed clockwise around the perimeter of the drawing. Point numbers are not needed for flat cable.

3.12.2 Harness Drawings

Assign point numbers in sequence starting in the lower left corner of the harness view. Proceed clockwise around the perimeter of the harness regardless of the number of sheets. Assign a number to each wire. Exceptions to this will be when two or more wires will share one connector lug. See the wire table in Figure 6, Run Number 11.

3.13 REFERENCE DESIGNATORS

Assign reference designators ("Pn" or "Jn") to each component per *DEC STD 056-0 Symbology - Circuit Schematic Requirements*. Also, show connector from rear (wiring side) view as in Figure 8.

Figure 7: Sample Cable Drawing

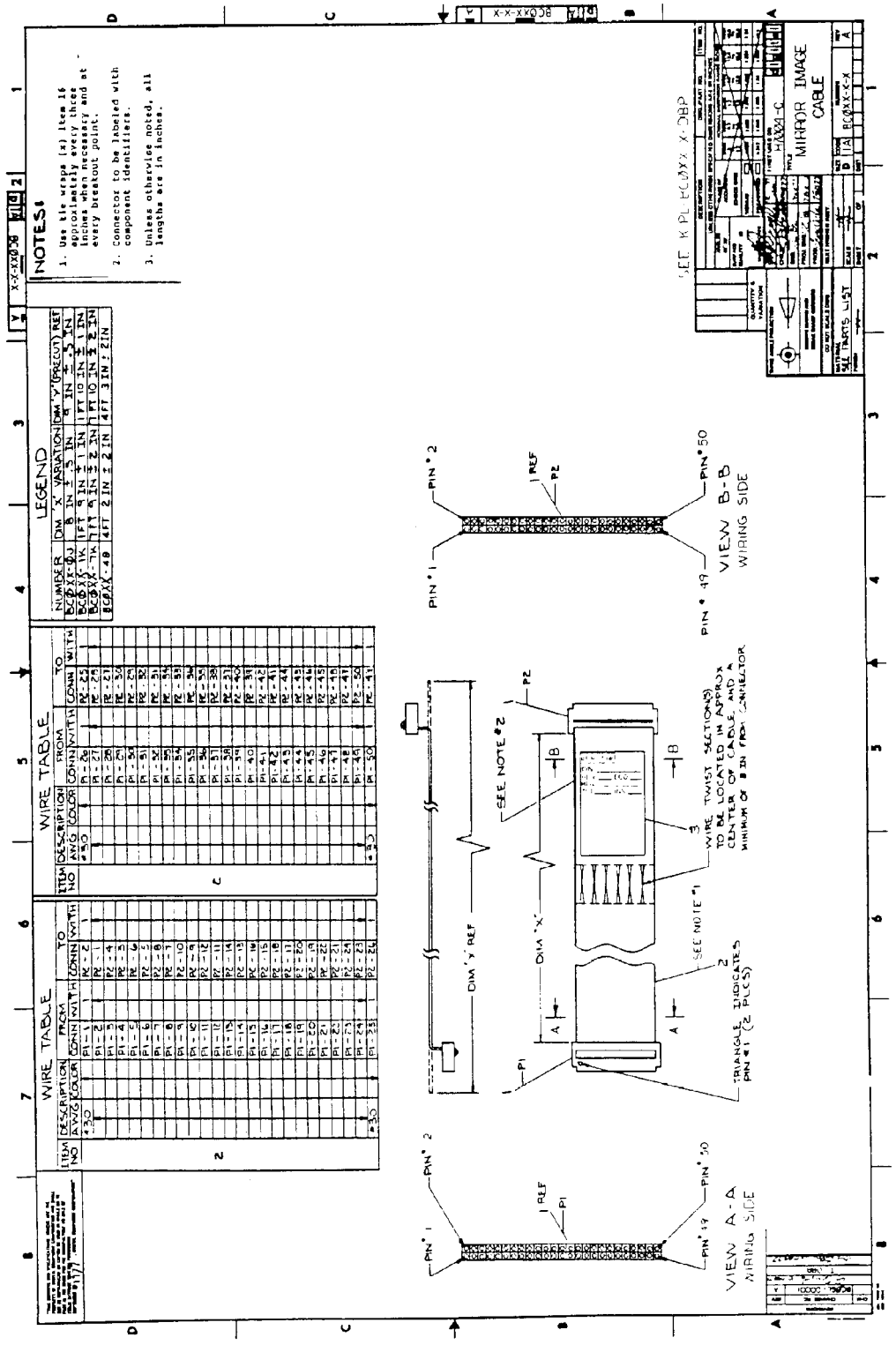
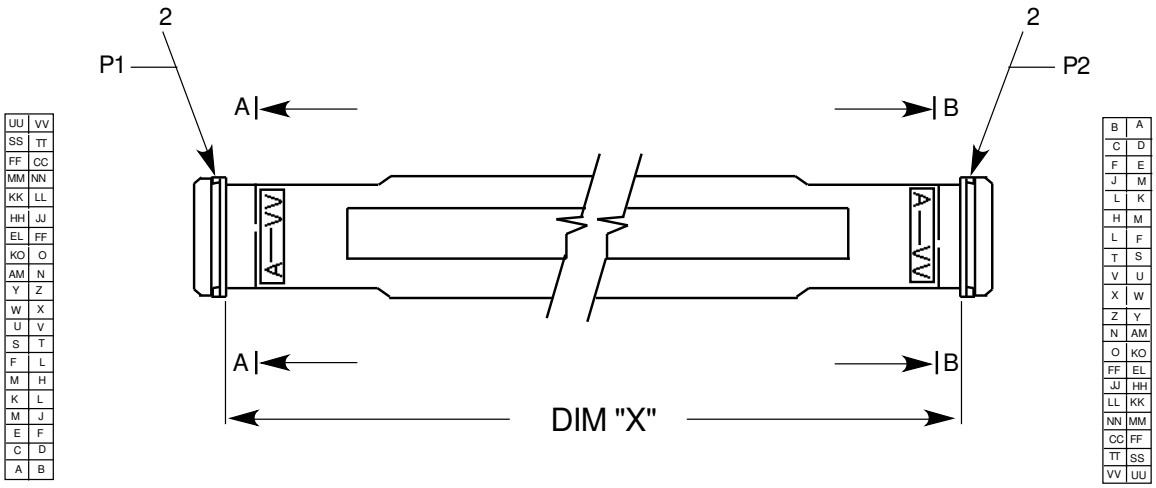


Figure 8: Flat Cable with Connector/Wiring Views



VIEW "A–A" VIEW "B–B"

4 ECO REQUIREMENTS

4.1 POINT NUMBERS AND REFERENCE DESIGNATORS

When an ECO affects a point number or a reference designator on the drawing, the following numbering system is used.

DELETIONS: When a part (for example, a breakout or connector) of the harness is deleted, it shall be completely removed from the drawing (not lined out). Any point numbers and reference designators relating to the deletion shall be removed and not reused. A note saying, "No longer used" shall be added.

ADDITIONS: When adding parts (for example, breakout sections or connectors) to a new harness design, assign the next sequential point number or reference designator to that part, starting from the last assigned point number or reference designator in the previous revision of the drawing.

5 PARTS LIST - REQUIREMENTS

5.1 AUTOMATED

Wiring harnesses and cable assemblies require an automated parts list. Refer to DEC STD 025-0 Parts Lists for requirements.

5.2 CONTENT

All the items needed to assemble the cable or harness must be clearly defined on the Parts List. The Parts List shall contain Digital part numbers, a description of the item, the item number as shown on the drawing, and the quantity needed of each item. Wire and tubing lengths must be specified on the Parts List. The use of "A/R" for "as required" shall be limited to bulk items that cannot be specified exactly. Refer to Figure 9, Sample Harness Parts List.

5.3 UNIT OF MEASURE

The unit of measure for the quantity specified is assumed to be "each". If any other unit is required, such as "feet" or "pound," that information shall be indicated by a note in the assembly or construction drawing. Refer to subhead 3.11.

6 IDENTIFICATION LABELS

All cable or harness assemblies are identified by use of a Digital identification label, such as 36-16073-00, 36-25366-XX, or the equivalent. If possible, the identification label should be positioned within one foot of the connector end.

On a harness assembly, the identification label shall appear in a visible location that will not interfere with the cable's final position within its destined assembly.

For specific requirements refer to *EL-MF343-00, Cable and Harness Identification Labels: Criteria and Application Methods.*

Figure 9: Sample Harness Parts List

PARTS LIST

Automated by PRTLST.3N(43) Sheet A1 of A1

Line	Item	Document Number	Part Number	Description	Quantity Per Variation 00
1	1		9107370–22	WIRE,STRND,14AWG,IPVC UL1534	54
2	2		9107370–44	WIRE,STRND,14AWG,IPVC UL1534	50
3	3		9107370–00	WIRE,STRND,14AWG,IPVC UL1534	32
4	4		9107370–66	WIRE,STRND,14AWG,IPVC UL1534	38
5	5		9107440–29	WIRE,STRND,14AWG,IPVC UL3317	72
6	6		9107701–00	CABLE, 2 COND. 20AWG	24
7	7		9107360–22	WIRE,STRND,18AWG,IPVC UL1429	6
8	8		9107360–66	WIRE,STRND,18AWG,IPVC UL1429	18
9	9		9107360–44	WIRE,STRND,18AWG,IPVC UL1429	10
10	10		9107360–55	WIRE,STRND,18AWG,IPVC UL1429	14
11	11		9007969–00	TERM QUICK 1POS INSULATED 16–14	14
12	12		1209350–09	MATE–N–LOK 9POS HSG,SKT	1
13	13		1209379–01	MATE–N–LOK SKT 20–14AWG LOOSE	3
14	14		9007930–00	TERM RING 1POS INSULATED, 22–16	6
15	15		9007926–01	TERM RING 1POS INSULATED, 12–10	8
16	16		9007880–00	TIE, CABLE BUNDL.DIA 0–1–1/4"=101	15
17	17		3616073–00	LABEL, CABLE IDENTIFICATION	1

18 Note: Quantities on items 1 thru 10 are in inches.

REVISION HISTORY			BASIC PART NO: 7000000	DRN: J.M.	DATE: 20–MAY–80	D I G I T A L	
ENG	ECO NUMBER	REV	SECTION A OF A			TITLE PARTS LIST	
	INITIAL	A	SECTION. VARIATION INDEX [A] 00	CHK'D: J.M.	DATE: 20–MAY–80	STANDARD WIRE HARNESS EXAMPLE	
			[B]	DES.ENG.: W.EMBY	DATE: 20–MAY–80		
			[C]	RESP.ENG.: W.EMBY	DATE: 20–MAY–80	DOCUMENT NUMBER	
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APPENDIX A REFERENCED DOCUMENTS

A.1 EL-Class Digital Documents

EL-Class Number	Document Title
EL-00013-00	*DEC STD 013-0 Standard Engineering Drawing Formats and Forms*
EL-00025-00	*DEC STD 025-0 Parts Lists*
EL-00056-00	*DEC STD 056-0 Circuit Diagrams and item Designations - General Requirements*
EL-00114-00	*DEC STD 114-0 Engineering Drawing Requirements - Industry Standards Adopted by Digital Engineering and Manufacturing Documentation Organizations*
EL-00116-04	*DEC STD 116-4 Workmanship Standards Manual - Cables and Harnesses*
EL-MF343-00	*Cable and Harness Identification Labels: Criteria and Application Methods*

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